



COMPUTATIONAL SCIENCE GRADUATE FELLOWSHIP PROGRAM

Each year, the U.S. Department of Energy, Office of Energy Research, sponsors the Computational Science Graduate Fellowship Program (CSGF) through the Mathematical, Informational and Computational Sciences Division of the Office of Computational and Technology Research. The program is administered for DOE by Krell Institute. Fellowships are awarded for one-year renewable terms from September 1 through August 31 in support of full-time doctoral study and thesis research in the United States. Study and research under the fellowship is to be conducted in an applied science or engineering discipline with applications in high-performance computing. This booklet contains information and a student application for the Computational Science Graduate Fellowship Program.

Additional applications and information are available from:

COMPUTATIONAL SCIENCE
GRADUATE FELLOWSHIP PROGRAM
Krell Institute
P.O. Box 511
Ames, IA 50010
515-233-6867

All forms may be reproduced as needed.

FELLOWSHIP PERIOD: SEPTEMBER 1, 1997 - AUGUST 31, 1998

**APPLICATIONS FOR 1997-98
MUST BE POSTMARKED NO LATER THAN
WEDNESDAY, January 29, 1997**

ANNOUNCEMENT OF STUDENT AWARDS WILL BE MADE MID-APRIL 1997

PROGRAM BENEFITS
(see Page 3)

All tuition and required fees will be paid for participants by DOE during the appointment period. The monthly stipend payment is as follows:

Years 1-4	Monthly Stipend Payments*	Annual Stipend
1	\$ 1,500	\$ 18,000
2	\$1,600	\$ 19,200
3	\$ 1,700	\$ 20,400
4	\$ 1,800	\$ 21,600

*Students usually undertake their practicum assignment after completion of their first year and receive an additional \$300 per month dislocation allowance during the practicum period.

This program is administered by Krell Institute for the Mathematical, Information and Computational Science Division of the Office of Computational and Technology Research.

NOTICE

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INTRODUCTION TO COMPUTATIONAL SCIENCE

A Definition of Computational Science

Computational science is the use of high-performance computer technology in an innovative and essential way to address and advance the state of knowledge in an applications discipline. The distinguishing aspect of computational science is its focus on the scientific/engineering applications discipline.

Computational science should not be confused with computer science. Computer science focuses on the computer itself. Projects in computer science might include designing a new operating system, or developing better library software (intrinsic functions, etc.). Computational science, on the other hand, emphasizes the use of the computer as another tool to solve problems in a scientific or engineering discipline. Projects in computational science might include computer based predictions of environmental changes, plasma dynamics for fusion energy, semiconductor design, or the study of fluid flow through geologic structures.

Opportunities for Computational Scientists

The study of computational science is receiving growing attention. Current progress in supercomputer technology provides innumerable opportunities for research that would have been difficult or impossible to conduct in previous years. Many scientists with computational backgrounds are needed to carry out this research at laboratories and other research facilities.

THE COMPUTATIONAL SCIENCE GRADUATE FELLOWSHIP

Program Objectives

The Department of Energy (DOE) is interested in areas of computational science that support the DOE mission. Working with current energy resources and exploring the possibilities for new forms of energy are DOE concerns that encompass many academic disciplines. In addition to these concerns, computational science is also of interest to DOE in the study of energy-related health issues, the transportation of energy products and by-products, oil and gas exploration and energy conservation -- just to name a few. A DOE Computational Science Graduate Fellow should be a graduate student who applies high-performance computational technology in a scientific or engineering discipline to help find answers to these energy issues.

The basic objective of the Computational Science Graduate Fellowship Program is to encourage talented students to enter a period of study and research in computational science accompanied by practical work experience at recognized research facilities.

The fellowship program is designed to provide incentive and encouragement to students with outstanding academic records to continue their graduate studies in preparation for careers in computational science.

The program is administered for DOE by the Krell Institute.

APPLICATION PROCEDURES FOR THE COMPUTATIONAL SCIENCE GRADUATE FELLOWSHIP PROGRAM

Eligibility

Students must be planning full-time, uninterrupted study toward a Ph.D. degree. Students in their first or second year of graduate study in the life, physical, engineering, and mathematical sciences are eligible to apply for the Computational Science Graduate Fellowship.

The award is limited to a maximum of 48 months and must be renewed each year. Duration of the award is affected by status of awardee and projected availability of funds. Renewal of the fellowship is based on excellent academic progress and research consistent with national goals in computational science.

Applicants must be either U.S. citizens or permanent resident aliens. This is an equal opportunity program open to all qualified persons without regard to race, sex, creed, color, age, handicap, or national origin.

Application Deadline

Completed applications will be accepted until the last Wednesday in January for fellowships beginning the following September. Applications from previous years or from other fellowship programs may not be used. An application is made up of the following parts:

- Background Information (Address, Education, etc.)
- Career and Academic Goals and Objectives
- List of Current and Planned Courses
- Official Transcripts
- Confidential References (3 Requested)
- GRE Scores

Please note: **All parts of the application (except the GRE scores) must be postmarked by January 29, 1997.** Late and/or incomplete applications will not be reviewed for awards.

Completed Applications

Completed applications and supporting materials should be forwarded to:

Computational Science Graduate Fellowship Program
Krell Institute
P.O. Box 511
Ames, IA 50010

Please include the fellowship program name on all of your correspondence. Mail without the program name included in the address may be delayed.

If you have questions about the application or need additional information, please call the Computational Science Graduate Fellowship Program Assistant at (515) -233-6867.

Program Benefits

All tuition and required fees will be paid for participants by DOE during the appointment period. The monthly stipend payment is as follows:

Years 1-4	Stipend Payment	Annual
1	\$1,500	\$18,000
2	\$1,600	\$19,200
3	\$1,700	\$20,400
4	\$1,800	\$21,600

All first-year fellowship recipients receive \$1,500 regardless of their current academic status. In addition, a practicum (research) assignment at a DOE research laboratory **is required** for at least one 3-month period. Students usually undertake their practicum assignment during the summer and may receive an additional \$300 per month dislocation allowance during the practicum period.

In addition, a \$1,000 allowance is paid annually to the university in behalf of the fellow. This money is to be used for duplication expenses, conferences, copies of conference proceedings, travel, or other expenses incurred by the student while doing research or activities directly related to the fellowship.

Upon application from the university, DOE will also provide matching funds up to \$2,500 for a computer workstation or for upgrade costs to a workstation for the student's use while attending the university under the fellowship program. Requests for matching funds must be made by the University Fellowship Coordinator.

The Department of Energy attempts to provide adequate funding to its fellowship participants for meeting the costs of graduate school. **If additional responsibilities, such as a research assistantship, are accepted, Krell Institute must be informed in advance and any resulting income will be deducted from the fellow's stipend.** However, scholarship awards, prizes, and other payments (including Veteran's Benefits) that do not require a service may be accepted by the fellowship participant.

Fellowship Obligations

The fellowship program requires a program of study that will provide a solid background in (1) a scientific or engineering discipline, (2) computer science and (3) applied mathematics. Your major field must fall in one of these categories, and you must demonstrate breadth through substantial academic achievement in the other two.

During the fellowship period, fellows are expected to be registered and enrolled as full-time graduate students at a U.S. college or university, conducting study and research within the objectives of the fellowship program. During the summer, students should be conducting full-time research related to the completion of their degrees, be enrolled in classes, or be on practicum assignments. Fellows are required to participate in a practicum for at least three months to gain computational science experience. This practicum must be done at a DOE research Lab.

Each fellow must agree to the conditions contained in the letter of appointment and its accompanying "Terms of Appointment." The fellow cannot claim any pecuniary award or compensation for inventions or discoveries made during the fellowship or resulting from it.

During the fellowship appointment period, fellows will be required to complete Fellowship Renewal Forms and a CSGF checklist regarding academic performance and course of study. These forms are completed in January of each year. If a current fellow desires to change institutions, the fellow will be considered a new applicant and must submit a new application. In addition, evaluation of the fellowship program continues for five years after the fellow has completed the program. Fellows must inform Krell Institute of their current addresses and complete evaluation/assessment questionnaires sent by Krell Institute for program information and/or evaluation. In accepting the fellowship, the fellow also agrees to entertain employment with DOE or one of its contractors at the end of a fellow's academic program should a reasonable offer be extended.

It is the applicant's responsibility to ensure that the application is complete and all reference letters have been received in the Fellowship Office by contacting Krell Institute.

Evaluation of Applications

After an application is checked and marked complete, it is submitted, along with all other complete applications, to a review panel. The review panel is made up of university, federal laboratory, or private and government sector personnel who are directly responsible for instruction and research in the area of computational science. The panel reviews each application and recommends award recipients to DOE. Applications are reviewed on the basis of grades, courses taken, GRE scores, career and academic goals and objectives, and references. The application evaluation is based on the student, as well as the institution and its program. The breadth of the program of study is of critical importance. The Department of Energy reviews the panel's recommendations and approves the final selection.

The number of awards given each year is dependent on the funding available and on the number of graduating fellows currently in the program. Some applicants who do not receive awards are selected for "Honorable Mention" status. This status recognizes their achievements and places them on a list for a possible award should additional funding become available.

After the Department of Energy approves the award recipients, Krell Institute notifies applicants of their award status. **Notification occurs in mid-April.** Once fellowships are awarded, Krell Institute handles the administration of the fellowship for DOE. Questions about stipends, payment of tuition and fees, practicum assignments, travel, etc. should be referred to Krell Institute during a student's fellowship tenure.

GUIDELINES FOR COMPLETING THE FELLOWSHIP APPLICATION FORM

The fellowship application contains several different sections. It is important that you fill out these sections accurately.

Student Data Section

- Current College/University and Current Mailing Address - Complete these sections for the school that is currently being attended. If permanent address is the same as school address write "same" on the permanent address line. Notify Krell Institute if your address changes after your application is submitted.
- Telephone Number - A telephone number is requested at both your school and permanent residence. Please make sure that the number listed is current. Krell Institute should be notified if the telephone number changes after your application is submitted. Also, please include a FAX number and e-mail address.
- Educational Information - List all universities attended. Be sure to include your current university and give an **anticipated graduation date**. Transcripts should be provided for each university listed. The undergraduate transcript should show evidence of the completion of an undergraduate degree.
- GPA - If university grading scale is other than 4.0 (for example, 5.0 or 6.0) please normalize to 4.0.
- GRE - List GRE scores if available. However, an official copy is still needed for the application file. Applicants should designate Krell Institute as a score report recipient, code number 6343. Because of testing schedules and deadlines, applicants are advised to seek GRE testing information early. The generally scheduled test dates in October and December are acceptable; however, test scores from the February test date will not be received in time for the application review.
- University Selection - Students may select any university for the fellowship. **The applicant's plan of study must be approved by the CSGF review committee.**

Program of Study

List the courses, including courses being taken this year, that will meet the Program of Study as defined below.

The Program of Study is of critical importance in the fellowship program. The basic academic requirements normally required for a graduate degree will probably not be sufficient to meet the requirements of the fellowship's Program of Study. The Program of Study must include a course curriculum that shows breadth in science, engineering, mathematics and computer science. The following represent a set of minimum requirements that must be met within the first two years of the fellowship award.

A science/engineering major must have at least:

2 semesters or 3 quarters of computer science courses

2 semesters or 3 quarters of mathematics courses

A computer science major must have at least:

2 semesters or 3 quarters of science/engineering courses

2 semesters or 3 quarters of mathematics courses

A mathematics major must have at least:

2 semesters or 3 quarters of science/engineering courses

2 semesters or 3 quarters of computer science courses

Courses must be at the junior, senior or graduate level. Auditing and Pass/Fail courses are not acceptable and do not meet requirements of the program.

Suggested computer science courses include: data structures, compilers, visualization/graphics, architectures, parallel computing, software engineering and theory of algorithms.

Suggested applied mathematics courses include: numerical analysis modelling, applied analysis, differential equations, asymptotics, linear algebra, Monte Carlo methods and stochastics. (Please note: numerical analysis courses are considered to be part of the mathematics coursework, not computer science coursework.)

Catalog/course descriptions for the courses you list are required. The Program of Study must be signed by the student's academic advisor.

Career and Academic Goals and Objectives

Limit your response to 300 words, as stated in the text.

Do not include published papers or pre-prints with the application materials.

Confidential References

Three reference forms are enclosed. It is suggested that your references be faculty members, preferably with at least one outside your major. **Please remember that references must be returned by the application deadline. It is the applicant's responsibility to ensure that all reference letters have been received in the Fellowship Office.**

Applications for Other Programs

Please note: All parts of the application (except GRE scores) must be postmarked by **January 29, 1997**. Late or incomplete applications will not be reviewed for awards. GRE scores should be received within one month after the deadline date or the application will be considered incomplete.

UNIVERSITIES WITH FELLOWSHIP EXPERIENCE

Please contact the Computational Science Graduate Fellowship Program Coordinators at the universities listed below to learn more about the programs available at each institution.

University of Arizona, Dr. Michael Tabor, Program in Applied Mathematics, Bldg. 89, Room 416, Tucson, AZ 85721 Phone: (602) 621-4664, FAX: (602) 621-8322, e-mail: tabor@math.arizona.edu

***Boston University**, Dr. Stephen Grossberg, Department of Cognitive & Neural Systems, 111 Cummington Street - Second Floor, Boston, MA 02215 Phone: (617) 353-9481, e-mail: steve@cns.bu.edu

***University of California - Berkeley**, Dr. Phil Colella, Department of Mechanical Engineering, 6119 Etcheverry Hall, Berkeley, CA 94720 Phone: (510) 642-2652, e-mail: colella@watt.ME.berkeley.edu

***University of California - Santa Barbara**, Ms. Jenny Sheffield, Graduate Division, Santa Barbara, CA 93106-2070 Phone: (805) 893-2710, e-mail: sheffield@graddiv.ucsb.edu

***University of California - San Diego**, Mr. Morgan Hunter, Office of Graduate Studies Research - 0003, 9500 Gilman Drive, La Jolla, CA 92093-0003 Phone: (619) 534-3724, e-mail: mhunter@ucsd.edu

***California Institute of Technology**, Dr. Arden Albee, Graduate Office, 02 Parsons Gates, Pasadena, CA 91125; Phone: (818) 356-6346, FAX: (818) 577-9246. Grad Office e-mail: gradofc@hamlet.caltech.edu It is best to reach him by FAX.

***Carnegie Mellon University**, Dr. Susan Burkette, Associate Provost, Research and Academic Administration, 5000 Forbes Avenue, Pittsburgh, PA 15213 Phone: (412) 268-8746, FAX: (412) 268-6279, e-mail: sd0c@andrew.cmu.edu

***Colorado State University**, Dr. David Zachmann, Mathematics and Civil Engineering, Fort Collins, CO 80523 Phone: (970) 491-1575; FAX: (970) 491-1303, e-mail: dzach@darcy.vis.colostate.edu

Columbia University, Dr. C.K. Chu, Chairman, Dept. of Applied Mathematics, Room 202 Mudd, 500 W. 120th Street, New York, NY 10027; Phone: (212) 854-2953, FAX: (212) 854-8257. e-mail: chu@cuplvx.apne.columbia.edu

Cornell University, Dr. David A. Caughey, Sibley School of Mechanical and Aerospace Engineering, 218 Upson Hall, Ithaca, NY 14853; Phone: (607) 255-3372, FAX: (607) 255-1222. e-mail: cac20@cornell.edu

***Duke University**, Betty Jones, Graduate Student Financial Aid Office, Box 90061, 120 Allen Building, Durham, NC 27708-0061 Phone: (919) 684-2277, e-mail: gfabbj@acpub.duke.edu

***Florida Atlantic University**, Dr. Henry Helmken, Dept. of Electrical Engineering, Room SE 456, 500 NW 20th Street, Boca Raton, FL 33431-0991; Phone: (561) 367-3452, e-mail: helmkenh@acc.fau.edu.

Florida State University, Jeff Lienau, 400 SCL, B-186, Tallahassee, FL 32306-4052; Phone: (904) 644-7008, FAX: (904) 644-6375, e-mail: lienau@scri.fsu.edu

University of Florida, Dr. David W. Mikolaitis, 316 Aero, Gainesville, FL 32611; Phone: (352) 392-7632, FAX: (352) 392-7303, e-mail: dwm@aemes.aero.ufl.edu

Georgia Institute of Technology, Dr. Helen E. Grena, Assoc. Vice President, Graduate Studies and Research, Atlanta, GA 30332-0265 Phone: (404) 894-3090, FAX: (404) 853-2688. e-mail: gp10@prism.gatech.edu

***Harvard University**, Dr. Russel Berg, Dean of Admissions, Grad School of Arts & Sciences, 226 Byerly Hall, Cambridge, MA 02138; Phone: (617) 495-1814, e-mail: berg@hugsas.harvard.edu

***University of Illinois**, Dr. Gaye Wong, Assistant Dean, Graduate College, National Center for Supercomputing Applications, 202 Coble Hall, 801 S. Wright Street, Champaign, IL 61820; Phone: (217) 333-0036, FAX: (217) 333-8019. e-mail: wong@ux1.cso.uiuc.edu

University of Iowa, Dr. Christoph Beckermann, Department of Mechanical Engineering, 2212 Engineering Building, Iowa City, IA 52242; Phone: (319) 335-5681, FAX: (319) 335-5669, e-mail: becker@icaen.uiowa.edu

***University of Maryland**, Dr. Nancy Lindley, Graduate Program Administrator, Department of Computer Science, AV Williams Building, College Park, MD 20742; Phone: (301) 405-2737, e-mail: lindley@cs.umd.edu

***Massachusetts Institute of Technology**, Ms. Jackie Sciacca, Fellowship Coordinator, Dean of the Graduate School Office, Room 3-134A, Cambridge, MA 02139-4307; Phone: (617) 253-1958, FAX: (617) 253-5620, e-mail: jackie@mitvmc.mit.edu

***University of Michigan**, Dr. William Martin, Chairman/Director, Dept. of Nuclear Engineering, Ann Arbor, MI 48109-2104; Phone: (313) 764-5534, FAX: (313) 763-4540, e-mail: wrm@caen.engin.umich.edu; also cc: Ms. Pam Derry, Program Assistant, Laboratory of Scientific Computation, University of Michigan, 2226 Student Activities Building, Ann Arbor, MI 48109; Phone: (313) 936-3130, FAX: (313) 763-4540, e-mail: pgderry@engin.umich.edu

University of Minnesota, Dr. Donald G. Truhlar, Director of Graduate Studies in Scientific Computation, Minnesota Supercomputer Institute, 1200 Washington Avenue South, Minneapolis, MN 55415; Phone: (612) 624-7555, FAX: (612) 624-8861, e-mail: truhlarl@t1.chem.umn.edu

Mississippi State University, Dr. Jerry Rogers, Electrical & Computer Engineering Dept., P.O. Box EE, Mississippi State, MS 39762; Phone: (601) 325-3912, FAX: (601) 325-2298, e-mail: rogers@ee.msstate.edu

University of Missouri-Rolla, Dr. Walter J. Gajda, Jr., Vice Chancellor for Academic Affairs, 204 Parker Hall, Rolla, MO 65401; Phone: (314) 341-4138, FAX: (314) 341-6306, e-mail: gajda@ee.umsr.edu

New York University, Dr. Peter Lax, Director of Courant Mathematics & Computing Laboratory, Courant Institute of Mathematical Sciences, 251 Mercer Street, New York, NY 10012; Phone: (212) 995-4125, FAX: (212) 995-4121, e-mail: lax@cims.nyu.edu

State University of New York at Stony Brook, Dr. Brent Lindquist, Dept. of Applied Mathematics & Statistics, A-137 Physics Bldg., Stony Brook, NY 11794-3600; Phone: (516) 632-8361, FAX: (516) 632-8490, e-mail: lindquis@ams.sunysb.edu

North Carolina State University, Dr. David Shafer, Associate Dean, The Graduate School, NCSU Box 7102, Raleigh, NC 27695; Phone: (919) 515-4462, FAX: (919) 515-2873, e-mail: david-shafer@ncsu.edu

***University of North Carolina**, Dr. Cass T. Miller, CB 7400 114 Rosenau Hall, Dept. of Environmental Science and Engineering, Chapel Hill, NC 27599-7400; Phone: (919) 966-2642, FAX: (919) 966-7141, e-mail: uncctm@gibbs.oit.unc.edu

Northwestern University, Ms. Patricia K. Mann, Graduate School Administration, 633 Clark Street, Evanston, IL 60208; Phone: (847) 491-8495, FAX: (847) 491-5070, e-mail: p-mann@nwu.edu

***University of Oregon**, Georgia Scott, Accounting; Geological Science, 100A Cascade Hall, Eugene, OR 97403 Phone: (541) 346-4574, e-mail: gscott@oregon.uoregon.edu

University of Pittsburgh, Dr. William Layton, Director, Scientific Computing Certification Program, Mathematics Department, 301 Thackeray Hall, Pittsburgh, PA 15260; Phone: (412) 624-8312, e-mail: wjl@vms.cis.pitt.edu

Princeton University, Technical Coordinator: Dr. Steven Orszag, Director, Applied Computational Mathematics Program, 206 Gas Dynamics, Washington Road, Princeton, NJ 08544-1000; Phone: (609) 258-6206, FAX: (609) 258-1054, e-mail: sao@cfp.princeton.edu. Administrative Coordinator: Ms. Sandra Mawhinney, Associate Dean for Budget and Adm. Affairs, Graduate School, PO Box 255, Princeton, NJ 08544-0255; Phone: (609) 258-3037, FAX: (609) 258-6180, e-mail: sandra@princeton.edu

***Purdue University**, Dr. G. V. Reklaitis, School of Chemical Engineering, West Lafayette, IN 47907-1283; Phone: (317) 494-4050, FAX: (317) 494-0805, e-mail: reklaiti@ecn.purdue.edu

Rensselaer Polytechnic Institute, Dr. Joseph Flaherty, Chairman, Computer Science Department, Amos Eaton Building, Troy, NY 12180-3590; Phone: (518) 276-6348, FAX: (518) 276-4033, e-mail: flaherje@cs.rpi.edu

***The Scripps Research Institute**, Marylyn Rinaldi, Office of Graduate Studies,
10666 North Trolley Pines Rd, La Jolla, CA 92037, Phone: (619) 554-
2872, e-mail: mrinaldi@scripps.edu

***Stanford University**, Dr. Robert W. MacCormack, Department of Aeronautics
and Astronautics, Durand Bldg., Rm 387b, Stanford, CA 94305; Phone:
(415) 723-4627, FAX: (415) 725-3377, e-mail: none

University of Tennessee, Dr. Jack Dongarra, Computer Science Department, 104
Ayres Hall Knoxville, TN 37996; Phone: (423) 974-8295, FAX: (423)
974-8296, e-mail: dongarra@cs.utk.edu

***Texas A&M University**, Ms. Rebeca Tipton, Institute for Scientific Computation,
633 Blocker, College Station, TX 77843-3404; Phone: (409) 862-2716, e-
mail: rebeca@isc.tamu.edu

The University of Texas at Austin, Ms. Mary Alice Davila, Office of Graduate
Studies, Main Bldg. 101, Austin, TX 78712; Phone: (512) 471-7213,
FAX: (512) 471-7620, e-mail: madavila@mail.utexas.edu

University of Tulsa, Dr. J.C. Diaz, Professor of Computer Science Department of
Mathematics & Computer Science, Keplinger Hall, U 365, 600 South Col-
lege Avenue, Tulsa, OK 74104-3189; Phone: (918) 631-2993, FAX: (918)
631-3077, e-mail: diaz@ucler.mcs.utulsa.edu

***University of Utah**, Dr. Christopher Johnson, Dept. of Computer Science, 3190
Merrill Engineering Building, Salt Lake City, UT 84112; Phone: (801)
581-7705, e-mail: crj@cs.utah.edu

Vanderbilt University, Dr. Thomas A. Cruse, Professor of Mechanical Engineer-
ing, Box 1592, Station B, Nashville, TN 37235; Phone: (615) 343-8727,
FAX: (615) 343-8730, e-mail: tcruse@vuse.vanderbilt.edu

University of Washington, Dr. Hannes Jonsson, Chemistry Department, BG-10,
Seattle, WA 98195; Phone: (206) 685-1804, FAX: (206) 685-8665, e-
mail: hannes@u.washington.edu

***University of Wisconsin**, Dr. Gregory Moses, Associate Dean-Research, Uni-
versity of Wisconsin, Engineering Research Building, 1500 Johnson
Drive, Madison, WI 53706; Phone: (608) 263-3248, FAX: (608) 262-
6707, e-mail: moses@engr.wisc.edu

Yale University, Dr. Mitchell Smooke, Chair, Department of Mechanical Engineer-
ing, New Haven, CT 06520; Phone: (203) 432-4344, FAX: (203) 432-
7654, e-mail: smooke%smooke@biomed.med.yale.edu

